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(54) DYNAMIC PRESSURE BEARING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an inexpensive dynamic pressure bearing device with little outgassing from a fixing part between parts and deterioration of fixing force with lapse of time, capable of enhancing efficiency of an assembly process.

SOLUTION: A bearing sleeve 8 is fit and fixed in a housing 7, a shaft part 2a of a shaft member 2 is inserted in an inner circumferential face 8a of the bearing sleeve 8, and then a thrust member 10 is attached to a lower end part of an inner circumferential face 7c of the housing 7, it is positioned in a predetermined position, and it is fixed by ultrasonic welding. By applying ultrasonic vibration while pressing a lower end part of the housing 7 against an outer circumferential face of the thrust member 10, a sealing surface of the housing 7 melts, and it is

fixed to the thrust member 10.

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CLAIMS

[Claim(s)]

[Claim 1]

Housing, the bearing sleeve fixed to the inner circumference of this housing, and the shank material which has a shank and a flange, The radial bearing section which carries out non-contact support of said shank in a radial direction in a dynamic pressure operation of the lubricating oil which it is prepared between the thrust member with which the end section of said housing was equipped, and said bearing sleeve and shank, and is produced in a radial bearing clearance, In hydrodynamic bearing equipment equipped with the thrust shaft receiving part which carries out non-contact support of said flange in the thrust direction in a dynamic pressure operation of the lubricating oil which it is prepared between said bearing sleeve and a thrust member, and a flange, and is produced in a thrust bearing clearance,

Hydrodynamic bearing equipment characterized by forming said housing with a

resin ingredient.

[Claim 2]

Housing, the bearing sleeve fixed to the inner circumference of this housing, and the shank material which has a shank and a flange, The radial bearing section which carries out non-contact support of said shank in a radial direction in a dynamic pressure operation of the lubricating oil which it is prepared between the thrust member with which the end section of said housing was equipped, and said bearing sleeve and shank, and is produced in a radial bearing clearance, In hydrodynamic bearing equipment equipped with the thrust shaft receiving part which carries out non-contact support of said flange in the thrust direction in a dynamic pressure operation of the lubricating oil which it is prepared between said bearing sleeve and a thrust member, and a flange, and is produced in a thrust bearing clearance,

Hydrodynamic bearing equipment characterized by fixing said thrust member to the end section of said housing by joining while forming said housing with a resin ingredient.

[Claim 3]

Housing, the bearing sleeve fixed to the inner circumference of this housing, and the shank material which has a shank and a flange, The radial bearing section which carries out non-contact support of said shank in a radial direction in a

dynamic pressure operation of the lubricating oil which it is prepared between the thrust member with which the end section of said housing was equipped, and said bearing sleeve and shank, and is produced in a radial bearing clearance, In hydrodynamic bearing equipment equipped with the thrust shaft receiving part which carries out non-contact support of said flange in the thrust direction in a dynamic pressure operation of the lubricating oil which it is prepared between said bearing sleeve and a thrust member, and a flange, and is produced in a thrust bearing clearance,

Hydrodynamic bearing equipment characterized by having equipped the end section of said HAUJIN with said thrust member, and fixing a closure member to this end section by joining while forming said housing with the resin ingredient.

[Claim 4]

Housing and the bearing sleeve of sintering metal fixed to the inner circumference of this housing, The shank material which has a shank and a flange, and the thrust member with which the end section of said housing was equipped, The radial bearing section which carries out non-contact support of said shank in a radial direction in a dynamic pressure operation of the lubricating oil which it is prepared between said bearing sleeves and shanks, and is produced in a radial bearing clearance, In hydrodynamic bearing equipment equipped with the thrust shaft receiving part which carries out non-contact

support of said flange in the thrust direction in a dynamic pressure operation of the lubricating oil which it is prepared between said bearing sleeve and a thrust member, and a flange, and is produced in a thrust bearing clearance,

Hydrodynamic bearing equipment characterized by fixing said bearing sleeve to the inner circumference of said housing by joining while forming said housing with a resin ingredient.

[Claim 5]

Housing, the bearing sleeve fixed to the inner circumference of this housing, and the shank material which has a shank and a flange, The thrust member with which the end section of said housing was equipped, and the seal member with which the other end of said housing was equipped, The radial bearing section which carries out non-contact support of said shank in a radial direction in a dynamic pressure operation of the lubricating oil which it is prepared between said bearing sleeves and shanks, and is produced in a radial bearing clearance, In hydrodynamic bearing equipment equipped with the thrust shaft receiving part which carries out non-contact support of said flange in the thrust direction in a dynamic pressure operation of the lubricating oil which it is prepared between said bearing sleeve and a thrust member, and a flange, and is produced in a thrust bearing clearance,

Hydrodynamic bearing equipment characterized by fixing said seal member to

the other end of said housing by joining while forming said housing with a resin ingredient.

[Claim 6]

Housing and the bearing sleeve of sintering metal fixed to the inner circumference of this housing, The shank material which has a shank and a flange, and the thrust member with which the end section of said housing was equipped, The radial bearing section which carries out non-contact support of said shank in a radial direction in a dynamic pressure operation of the lubricating oil which it is prepared between said bearing sleeves and shanks, and is produced in a radial bearing clearance, In hydrodynamic bearing equipment equipped with the thrust shaft receiving part which carries out non-contact support of said flange in the thrust direction in a dynamic pressure operation of the lubricating oil which it is prepared between said bearing sleeve and a thrust member, and a flange, and is produced in a thrust bearing clearance,

Hydrodynamic bearing equipment characterized by fixing said bearing sleeve to the inner circumference of said housing by joining while forming said housing with said bearing sleeve and a metallic material of the same kind.

[Claim 7]

Hydrodynamic bearing equipment given in any of claims 2-5 characterized by adopting ultrasonic welding as said joining they are.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

This invention relates to the hydrodynamic bearing equipment which enables non-contact support of the revolution of shank material in a dynamic pressure operation of the lubricating oil produced in a bearing clearance. This bearing equipment is suitable as objects for small motors, such as spindle motors, such as optical-magnetic disc equipment, such as optical disk units, such as magnetic disk drives, such as information machines and equipment, for example, HDD, FDD, etc., CD-ROM, CD-R/RW, and DVD-ROM/RAM, and MD, MO, a polygon scanner motor of a laser beam printer (LBP), or an electrical machinery and apparatus, for example, an axial flow fan etc.

[0002]

[Description of the Prior Art]

The various above-mentioned motors are asked for improvement in the speed besides high rotational accuracy, low-cost-izing, low noise-ization, etc. The bearing which supports the spindle of the motor concerned is in one of the

components which determine these military requirements, and the activity of the hydrodynamic bearing which has the property excellent in the above-mentioned military requirement as this kind of bearing in recent years is considered, or it is used actually.

[0003]

For example, with the hydrodynamic bearing equipment built into the spindle motor of disk units, such as HDD, the radial bearing section which enables non-contact support of the revolution of shank material to a radial direction, and thrust bearing which enables non-contact support of the revolution of shank material in the thrust direction are prepared, and the hydrodynamic bearing which established the slot for dynamic pressure generating (dynamic pressure slot) in the inner skin of a bearing sleeve or the peripheral face of shank material is used as the radial bearing section. The hydrodynamic bearing which established the dynamic pressure slot in the ends side of the flange of shank material or the fields (the end face of a bearing sleeve, end face of the thrust-section material fixed to housing, etc.) which counter this as the thrust-bearing section, for example is used (for example, patent reference 1 reference).

[0004]

Usually, a bearing sleeve arranges a seal member in opening of housing in

many cases, in order to prevent that the lubricating oil with which it was fixed to the predetermined location of the inner circumference of housing, and the building envelope of housing was lubricated leaks outside.

[0005]

[Patent reference 1]

Provisional-publication-of-a-patent No. 291648 [2000 to] official report

[0006]

[Problem(s) to be Solved by the Invention]

The hydrodynamic bearing equipment of the above-mentioned configuration consists of components, such as housing, a bearing sleeve, shank material, a thrust member, and a seal member, and efforts to raise the process tolerance and assembly precision of each part article are made that the high bearing engine performance needed with the more and more high-performance-izing of information machines and equipment should be secured. On the other hand in connection with the inclination of low-pricing of information machines and equipment, the demand of cost reduction to this kind of hydrodynamic bearing equipment is also still severer.

[0007]

When attaining low cost-ization of this kind of hydrodynamic bearing equipment, the increase in efficiency like an erector is set to one of the important points.

That is, although it fixes using adhesives in many cases, housing, a bearing sleeve and housing, a thrust member and housing, and a seal member require time amount comparatively long by solidification from spreading of adhesives, and usually serve as a cause which the effectiveness like an erector reduces. Moreover, we are anxious also about the possibility of generating of out gas or degradation of adhesive strength with the passage of time by adhesives.

[0008]

The technical problem of this invention is being able to attain the increase in efficiency like an erector and offering much more low cost hydrodynamic bearing equipment.

[0009]

Other technical problems of this invention are offering hydrodynamic bearing equipment with little degradation of the out generation of gas from the fixed part between components, or the fixed force with the passage of time.

[0010]

[Means for Solving the Problem]

The bearing sleeve by which this invention was fixed to the inner circumference of housing and housing in order to solve the above-mentioned technical problem, The shank material which has a shank and a flange, and the thrust member with which the end section of housing was equipped, The radial bearing section

which carries out non-contact support of the shank in a radial direction in a dynamic pressure operation of the lubricating oil which it is prepared between a bearing sleeve and a shank and is produced in a radial bearing clearance, It is prepared between a bearing sleeve and a thrust member, and a flange, and the configuration which formed housing with the resin ingredient is offered in hydrodynamic bearing equipment equipped with thrust bearing which carries out non-contact support of the flange in the thrust direction in a dynamic pressure operation of the lubricating oil produced in a thrust bearing clearance.

[0011]

Since housing made of resin can be formed by die forming, such as injection molding, while being able to manufacture by low cost compared with metal housing by machining of lathe turning etc., compared with metal housing by press working of sheet metal, a comparatively high precision is securable.

[0012]

In the above-mentioned configuration, a thrust member can be considered as the configuration fixed by joining at the end section of housing made of resin. While being able to raise working efficiency by fixing housing and a thrust member by joining compared with immobilization by the conventional adhesives, degradation of the out generation of gas from a fixed part or the fixed force with the passage of time can be prevented or controlled.

[0013]

Here, "joining" means the phenomenon which the plane of composition of the one side of two members or the both sides which should be joined fuses and fixes. As a joining means, according to the construction material and the junction conditions of the member which should be joined, and other terms and conditions, ultrasonic welding, oscillating joining, high-frequency-induction-heating joining, the heat version joining, etc. can be chosen suitably, and can be adopted, for example. Generally, ultrasonic welding is the approach of making some resin products generate powerful frictional heat, making carry out melting of the plane of composition, and fixing by applying welding pressure to supersonic vibration and coincidence. Moreover, oscillating joining is a direction which is made to carry out melting of the plane of composition, and fixes by making it vibrate in the predetermined direction, pressurizing two members which should be joined. Moreover, high-frequency-induction-heating joining is the approach of impressing a high-frequency field to the member which should be joined, making generate heat by overcurrent loss, making carry out melting of the plane of composition, and fixing. Moreover, the heat version joining is the approach of contacting a hot heat source (hot platen) to the plane of composition of a resin product, making carry out melting of the plane of composition, and fixing. Especially ultrasonic

welding is desirable from the point that a facility is easy, and ends among these joining approaches, and a joining activity can be done in a short time.

[0014]

It may replace with the above-mentioned configuration, and the end section of housing made of resin may be equipped with a thrust member, and a closure member may be fixed to the end section of this housing by joining.

[0015]

Moreover, the above-mentioned joining may be applied to immobilization with housing made of resin, and a bearing sleeve. In this case, by forming a bearing sleeve with a sintered metal, at the time of joining, the melting resin of the plane of composition of housing invades in internal pore, and solidifies from surface puncturing (part where the internal pore of the porous structure of a sintered metal is punctured and formed in a front face) of the plane of composition of a bearing sleeve. And since the part solidified within internal pore sticks housing and a bearing sleeve firmly according to a kind of anchor effect, the relative location gap between both does not arise, but the stable fixed condition is acquired.

[0016]

When preparing the seal section in the other end of housing, this seal section is formed by really being formed in the other end of housing, or fixing the seal

member of another object to the other end of housing. In the case of the latter, the above-mentioned joining may be applied to immobilization with housing made of resin, and a seal member.

[0017]

As for the resin ingredient which forms housing, it is desirable that it is thermoplastics, and it is more desirable that the coefficient of linear expansion is less than [8.0x10-5/degree C] in housing which carries out press fit immobilization of the bearing sleeve especially at inner circumference. That is, in housing which carries out press fit immobilization of the bearing sleeve, the press fit fixed force of bearing the specification acceleration of the self-weight x impact test of a bearing sleeve is needed. In order to secure the press fit fixed force needed by 0-80-degreeC which is the operating temperature limits of this kind of hydrodynamic bearing equipment, the coefficient of linear expansion of the resin ingredient which forms housing is good to consider as less than [8.0x10-5/degree C]. In addition, although the press fit fixed force can also be heightened by enlarging the press fit cost of a bearing sleeve to housing, when the press fit cost of housing made of resin is the thin meat with the thickness of housing following 2mm, 100 micrometers of press fit cost are about 50 micrometers preferably at the maximum. If press fit cost is enlarged more than this, while the outer-diameter dimensional accuracy of housing may fall and

trouble may arise on the occasion of the nest to a spindle motor etc., a crack may arise in housing with excessive insertion pressure. Specifically, the resin ingredient which uses LCP or PES as a principal component can be used as a resin ingredient which forms housing.

[0018]

Moreover, while forming a bearing sleeve with a sintered metal, housing is formed with a bearing sleeve and a metallic material of the same kind, and you may make it fix a bearing sleeve to the inner circumference of housing by joining. Here, it means that a principal component (base metal) is the same as "congener." For example, when the bearing sleeve is formed with the sintered metal which uses copper as a principal component, housing is formed with a copper system metal, for example, brass. Thus, by constituting, housing and a bearing sleeve are firmly fixable with ultrasonic welding etc.

[0019]

[Embodiment of the Invention]

Hereafter, the operation gestalt of this invention is explained.

[0020]

Drawing 1 shows the example of 1 configuration of the information machine dexterous spindle motor incorporating the hydrodynamic bearing equipment 1 concerning this operation gestalt. This spindle motor is used for disk driving

gears, such as HDD, and is equipped with the hydrodynamic bearing equipment 1 which enables non-contact support of the revolution of the shank material 2, the disk hub 3 with which the shank material 2 was equipped, and the motor stator 4 and the motor rotor 5 made to counter through a radial gap. A stator 4 is attached in the periphery of casing 6, and a mounting eclipse and Rota 5 are attached in the inner circumference of the disk hub 3. The inner circumference of casing 6 is equipped with the housing 7 of hydrodynamic bearing equipment 1. the disk hub 3 -- the disks D, such as a magnetic disk, -- 1 -- or two or more sheets are held. If it energizes to a stator 4, by it, Rota 5 will rotate by the electromagnetic force between a stator 4 and Rota 5, and they will rotate [the disk hub 3 and the shank material 2 are united and].

[0021]

Drawing 2 shows hydrodynamic bearing equipment 1. This hydrodynamic bearing equipment 1 carries out the component part of housing 7, the bearing sleeve 8 and the thrust member 10 which were fixed to housing 7, and the shank material 2, and is constituted.

[0022]

The 1st radial bearing section R1 and the 2nd radial bearing section R2 are isolated and formed in shaft orientations between the peripheral faces two a1 of inner skin 8a of a bearing sleeve 8, and shank 2a of the shank material 2.

Moreover, the 1st thrust-bearing section S1 is formed between bottom end-face 8c of a bearing sleeve 8, and upside end-face 2b1 of flange 2b of the shank material 2, and the 2nd thrust-bearing section S2 is formed between end-face 10a of the thrust-section material 10, and bottom end-face 2b2 of flange 2b. In addition, explanation is advanced by making the bottom, thrust member 10, and objection side by the expedient top side of explanation, and the thrust member 10 side into an upside.

[0023]

Housing 7 injection molded thermoplastics, was formed and is equipped with cylinder-like flank 7b and annular seal section 7a prolonged in the bore side from the upper bed of flank 7b at one. The inner skin seven a1 of seal section 7a counters through the taper side two a2 established in the periphery of shank 2a, and the predetermined seal space S. In addition, the diameter of the taper side two a2 of shank 2a is gradually reduced toward an upside (exterior side to housing 7), and it functions also as a centrifugal-force seal by the revolution of the shank material 2.

[0024]

The shank material 2 was formed with metallic materials, such as stainless steel, and is equipped with shank 2a and flange 2b prepared in the soffit of shank 2a at one or another object.

[0025]

A bearing sleeve 8 is formed in the shape of a cylinder by the porous body which consists of a sintered metal, especially the porous body of the sintered metal which uses copper as a principal component, and is fixed to the predetermined location of inner skin 7c of housing 7.

[0026]

the field of two upper and lower sides used as the radial bearing side of the 1st radial bearing section R1 and the 2nd radial bearing section R2 is isolated to shaft orientations, and prepares in inner skin 8a of the bearing sleeve 8 formed with this sintered metal -- having -- this -- the dynamic pressure slot eight a1 of a herringbone configuration as shown in drawing 3 (a), and eight a2 are formed in two fields, respectively. The upper dynamic pressure slot eight a1 is formed in shaft-orientations asymmetry to the shaft-orientations core m (center of shaft orientations of the up-and-down field between dip and a slot), and the shaft-orientations dimension X1 of a **** [core / m / shaft-orientations] field is larger than the shaft-orientations dimension X2 of a bottom field. Moreover, 1 or 8d of two or more shaft-orientations slots, 1 covers a shaft-orientations overall length and is formed in 8d of peripheral faces of a bearing sleeve 8. In this example, 1 is formed in periphery regular intervals 8d of three shaft-orientations slots.

[0027]

The dynamic pressure slot 8c1 of a spiral configuration as shown in drawing 3 (b) is formed in bottom end-face 8c of a bearing sleeve 8 used as the thrust-bearing side of the 1st thrust-bearing section S1. In addition, a herringbone configuration, a radial furrow configuration, etc. may be adopted as a configuration of a dynamic pressure slot.

[0028]

As shown in drawing 3 (c), upside end-face 8b of a bearing sleeve 8 is divided by the periphery slot eight b1 established in the radial abbreviation center section to the bore side field eight b2 and the outer-diameter side field eight b3, and 1 or two or more radial slots eight b21 are formed in the bore side field eight b2. In this example, three radial slots eight b21 are formed in periphery regular intervals.

[0029]

The thrust member 10 is formed with metallic materials, such as brass, and is fixed to the soffit section of inner skin 7c of housing 7. As shown in drawing 4 , the dynamic pressure slot ten a1 of a herringbone configuration is formed in end-face 10a of the thrust member 10 used as the thrust bearing side of the 2nd thrust bearing section S2. In addition, a spiral configuration, a radial furrow configuration, etc. may be adopted as a configuration of a dynamic pressure slot.

[0030]

The hydrodynamic bearing equipment 1 of this operation gestalt is assembled at the following processes, for example.

[0031]

First, a bearing sleeve 8 is pressed fit in inner skin 7c of housing 7, and the upside end-face 8b is made to contact the medial surface seven a2 of seal section 7a. Thereby, it is fixed where a bearing sleeve 8 is positioned to housing 7.

[0032]

As shown in drawing 2 , the medial surface seven a2 of seal section 7a is formed the letter of dip, or in the shape of a bow so that the outer-diameter side field may separate from upside end-face 8b of a bearing sleeve 8. Therefore, the medial surface seven a2 of seal section 7a contacts selectively the bore side field eight b2 of upside end-face 8b of a bearing sleeve 8, and a clearance is formed between a medial surface seven a2 and the outer-diameter side field eight b3 of upside end-face 8b.

[0033]

Next, a bearing sleeve 8 is equipped with the shank material 2. In addition, a radial bearing clearance can be set up with a sufficient precision by measuring the inside diameter, where press fit immobilization of the bearing sleeve 8 is

carried out at housing 7, and performing dimension matching with the outer-diameter dimension (it measuring beforehand.) of shank 2a. Or by making the cross-section configuration of inner skin 7c of housing 7 into the shape of a polygon (for example, 20 angle configuration), or a concavo-convex configuration, and making 8d of peripheral faces of a bearing sleeve 8 contact selectively, deformation of inner skin 8a at the time of pressing a bearing sleeve 8 fit can be controlled, and the precision of a radial bearing clearance can be secured.

[0034]

Then, after equipping the soffit section of inner skin 7c of housing 7 with the thrust member 10 and positioning in a predetermined location, it fixes by ultrasonic welding. Pressurizing the soffit section of housing 7 at the peripheral face of the thrust member 10, by adding supersonic vibration, the plane of composition of housing 7 fuses and it fixes with the thrust member 10. If concavo-convex configurations, such as the shape of the shape of a knurling tool or a screw thread, are prepared in the peripheral face of the thrust member 10 in that case, it is effective when heightening the fixed force by joining.

[0035]

If assembly is completed as mentioned above, shank 2a of the shank material 2 is inserted in inner skin 8a of a bearing sleeve 8, and flange 2b will be in the

condition of having held in the space section between bottom end-face 8c of a bearing sleeve 8, and end-face 10a of the thrust member 10. Then, the building envelope of the housing 7 sealed by seal section 7a is full of a lubricating oil including the internal pore of a bearing sleeve 8. The fuel level of a lubricating oil is maintained within the limits of the seal space S.

[0036]

In addition, it may replace with the above-mentioned press fit as a means to fix a bearing sleeve 8 to housing 7, and joining, for example, ultrasonic welding, may be adopted. In that case, it is good to prepare the shaft-orientations slot (two or more [1 or]) which has the volume equivalent to the volume of the above-mentioned melting resin in inner skin 7c of housing 7 so that the resin which the plane of composition of housing 7 fused may not flow to the part of seal section 7a.

[0037]

The field (field of two upper and lower sides) used as the radial bearing side of inner skin 8a of a bearing sleeve 8 counters through the peripheral face two a1 and radial bearing clearance between shank 2a, respectively at the time of the revolution of the shank material 2. Moreover, the field used as the thrust-bearing side of bottom end-face 8c of a bearing sleeve 8 counters through upside end-face 2b1 and the thrust-bearing clearance between flange 2bs, and the field

used as the thrust-bearing side of end-face 10a of the thrust-section material 10 counters through bottom end-face 2b2 and the thrust-bearing clearance between flange 2bs. And with the revolution of the shank material 2, the dynamic pressure of a lubricating oil occurs in the above-mentioned radial bearing clearance, and non-contact support of the revolution of shank 2a of the shank material 2 to a radial direction is enabled with the oil film of the lubricating oil formed in the above-mentioned radial bearing clearance. Thereby, the 1st radial bearing section R1 and the 2nd radial bearing section R2 which enable non-contact support of the revolution of the shank material 2 to a radial direction are constituted. Simultaneously, the dynamic pressure of a lubricating oil occurs in the above-mentioned thrust-bearing clearance, and non-contact support of the revolution of flange 2b of the shank material 2 in both the thrust direction is enabled with the oil film of the lubricating oil formed in the above-mentioned thrust-bearing clearance. Thereby, the 1st thrust bearing section S1 and the 2nd thrust bearing section S2 which enable non-contact support of the revolution of the shank material 2 in the thrust direction are constituted.

[0038]

As mentioned above, the dynamic pressure slot eight a1 of the 1st radial bearing section R1 is formed in shaft-orientations asymmetry to the shaft-orientations core m, and the shaft-orientations dimension X1 of a **** [core / m /

shaft-orientations] field is larger than the shaft-orientations dimension X2 of a bottom field { drawing 3 (a)}. Therefore, as for the drawing-in force (pumping force) of the lubricating oil by the dynamic pressure slot eight a1, an upside field becomes large relatively compared with a bottom field at the time of the revolution of the shank material 2. And the lubricating oil filled in the clearance between the peripheral faces two a1 of inner skin 8a of a bearing sleeve 8 and shank 2a flows caudad by the differential pressure of this drawing-in force. The clearance between the medial surface seven a2 of 8d 1 of thrust bearing clearance -> shaft-orientations slots -> seal member 2a of the 1st thrust bearing section S1, and the outer-diameter side field eight b3 of upside end-face 8b of a bearing sleeve 8 -> The radial slot eight b21 of upside end-face 8b of the periphery slot 8b1 -> bearing sleeve 8 of upside end-face 8b of a bearing sleeve 8 It circulates through the path to say and is again drawn in the radial bearing clearance between the 1st radial bearing sections R1. Thus, with constituting so that a lubricating oil may carry out floating circulation of the building envelope of housing 7, the phenomenon in which the pressure of the lubricating oil in a building envelope becomes negative pressure locally can be prevented, and problems resulting from generation of the air bubbles accompanying negative pressure generating and generation of air bubbles, such as leakage of a lubricating oil and generating of an oscillation, can be solved. Moreover, since it

is discharged by the open air from the fuel level (gas-liquid interface) of the lubricating oil in the seal space S in case air bubbles circulate in connection with a lubricating oil even when air bubbles mix into a lubricating oil by a certain reason, the adverse effect by air bubbles is prevented much more effectively.

[0039]

Drawing 5 shows hydrodynamic bearing equipment 1' concerning other operation gestalten. The point that this hydrodynamic bearing equipment 1' differs from the hydrodynamic bearing equipment 1 shown in drawing 2 substantially is in the point which fixed the closure member 11 to this soffit section by joining, after equipping the soffit section of inner skin 7c of housing 7 with thrust member 10'.

[0040]

Thrust member 10' was formed with metallic materials, such as brass, and equips end-face 10a' used as the thrust bearing surface of the 2nd thrust bearing S2 with the dynamic pressure slot of for example, a herringbone configuration. Moreover, one is equipped with annular contact section 10b' prolonged in the upper part from the periphery edge of end-face 10a'. The upside end face of contact section 10b' contacts bottom end-face 8c of a bearing sleeve 8, and the inner skin of contact section 10b' counters through the peripheral face and clearance between flange 2bs.

[0041]

The closure member 11 is formed for example, with a resin ingredient, and is preferably formed in a gestalt as shown in drawing 6 . The closure member 11 shown in this drawing equipped the peripheral face with rib 11b for joining (part which became narrow to full), and equips the periphery bottom corner with concave ******** 11c. Upside side 11a of the closure member 11 is contacted by the bottom side of thrust member 10'.

[0042]

After incorporating in the mode which mentioned above a bearing sleeve 8 and the shank material 2, thrust member 10' is inserted in the soffit section of inner skin 7c of housing 7, and the upside end face of the contact section 10b' is made to contact bottom end-face 8c of a bearing sleeve 8. Thereby, the shaft-orientations location of thrust member 10' to a bearing sleeve 8 is decided. By managing the shaft-orientations dimension of contact section 10b' and flange 2b, the thrust bearing clearance between the 1st thrust bearing section S1 and the 2nd thrust bearing section S2 can be set up with a sufficient precision. Then, equipping the soffit section of inner skin 7c with the closure member 11, making the upside side 11a contact the bottom side of thrust member 10', and pressurizing the soffit section of housing 7 at rib 11b for joining of the closure member 11 By adding supersonic vibration, rib 11b for (ultrasonic welding)

joining fuses, and it fixes with the plane of composition of housing 7 (the plane of composition of housing 7 may also be fused depending on joining conditions). . Since the resin fluidized by melting of rib 11b for joining goes into ******** 11c at the time of joining, it is hard to generate the resin weld flash after joining.

[0043]

Drawing 7 shows hydrodynamic bearing equipment 1" concerning other operation gestalten. The point that this hydrodynamic bearing equipment 1" differs from the hydrodynamic bearing equipment 1 shown in drawing 2 substantially is a point which constituted the seal section from a seal member 12 of another object, and fixed the seal member 12 to the upper bed section of inner skin 7c of housing 7 by joining. The seal member 12 is formed for example, with a resin ingredient, and joining is carried out to the plane of composition of housing 7 by ultrasonic welding. Inner skin 12a of the seal member 12 counters through the taper side two a2 established in the periphery of shank 2a, and the predetermined seal space S.

[0044]

Although housing 7 is formed with the resin ingredient in the above example, it is good also as a configuration which forms housing with a bearing sleeve 8 and a metallic material of the same kind, for example, brass, and fixes both by joining, for example, ultrasonic welding.

[Effect of the Invention]

As mentioned above, according to this invention, the increase in efficiency like an erector can be attained and hydrodynamic bearing equipment with little degradation of the out generation of gas from the fixed part between components or the fixed force with the passage of time can be further offered by low cost.

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view of the information machine dexterous spindle motor which used the hydrodynamic bearing equipment concerning this invention.

[Drawing 2] It is the sectional view showing 1 operation gestalt of the hydrodynamic bearing equipment concerning this invention.

[Drawing 3] It is drawing showing the sectional view { drawing 3 (a)} of a bearing sleeve, a bottom end face { drawing 3 (b)}, and an upside end face { drawing 3 (c)}.

[Drawing 4] It is drawing showing the end face of a thrust member.

[Drawing 5] It is the sectional view showing other operation gestalten of this

invention.

[Drawing 6] It is the sectional view of a closure member.

[Drawing 7] It is the sectional view showing other operation gestalten of this invention.

[Description of Notations]

1, 1', 1" Hydrodynamic bearing equipment

2 Shank Material

2a Shank

2b Flange

7 Housing

7a Seal section

7c Inner skin

8 Bearing Sleeve

R1 Radial bearing section

R2 Radial bearing section

S1 Thrust bearing section

S2 Thrust bearing section

10 10' Thrust member

11 Closure Member

12 Seal Member